RioTinto

Kennecott Eagle Minerals
Victoria Peacey
HSE Manager
504 Spruce Street
Ishpeming, Michigan 49849
(906) 486-1257

February 12, 2010

Mr. Joe Maki
Michigan Department of Natural Resources and Environment
420 5th Street
Gwinn, MI 49841

Dear Mr. Maki:

Subject: **Application for Amendment, Nonferrous Metallic Mineral Mining Permit MP012007, Kennecott Eagle Minerals Company**

KEMC is requesting a modification to the design basis of permit number GW1810162 for the option to construct a surface-based rapid infiltration system at grade. A modification to this design basis would result in no change to the quantity, effluent characteristics and treatment process or chief precepts of the rapid infiltration system design. In addition, the basis of design change would not require any changes to the permit conditions listed in GW1810162. However, this change in the basis of design would require minor changes to the working of the mine plan incorporated into MP012007.

Accordingly, under general permit condition D(5)(b) and special permit condition C(6) of MP012007, this letter notifies you of the design change. The suggested minor changes to the text of the mining plan that reflect the change to a surface-based rapid infiltration system are enclosed.

Should you have questions please don't hesitate to contact me at 906-486-1257.

Sincerely,

Vicky Peacey
HSE Manager

cc: Hal Fitch, MDNRE
Dennis Donohue, Warner Norcross and Judd
Jon Cherry, Kennecott Eagle Minerals Company
Alicia Duex, Kennecott Eagle Minerals Company

4.2.3 Excavation, Stockpiling and Earthwork Balance for Surface Structures

The preliminary earthwork balance is based on the design of the primary environmental protection structures that include the TDRSA, CWBs, NCWIBs and the TWIS. Note that grading for the other buildings and structures for the Eagle Project is considered incidental since these structures will, for the most part, be constructed at grade. Also, excavated rock during the mine development is not included in the earthwork balance since development rock will be temporarily stored in the TDRSA and eventually used as backfill in the mine stopes.

Table 4-3 provides the earthwork balance for the facility construction as displayed on Figure 4-2. The cut needed to prepare the grades for the major facilities will be used to ~~cover the TWIS and~~ construct the soil berms. Excess soil from the site development will be placed in berms around the facility as shown on Figure 4-2. The soils placed in the berms will be used during the reclamation phase to return the mine site area to the reclamation grades. Also, if building and other structures need fill for the final design grades, this material can be removed from the stockpiled berms.

Table 4-3
Earthwork Balance

Structure		Cut (-) (1)(yd^3)	Required Fill(2) (+) (1)(yd^3)	Net (+/-) (1)(yd^3)	Comments
Stripping/Stockpiling					Refer to Note #3- Excess
Topsoil		28,600(3)	11,400	+17,200	topsoil will be stockpiled
CWB #1(4)		28,800	1200	+27,600	--
CWB #2(4)		28,800	1200	+27,600	--
NCWIB #3(4)		15,700	1200	+14,500	--
NCWIB #4(4)		8,500	800	+7,700	--
NCWIB #5(4)		4,800	700	+4,100	--
NCWIB #6(4)		1,300	400	+900	--
~~TWIS5-~~		~~--------~~	~~29,800~~	~~-29,800~~	~~Five foot cover over infiltration piping~~
TDRSA		134,800	2,600	+ 132,200	--
Berms		--------	231,800	-231,800	See Figure 4-2
	Total	251,300	251,300	0	

Notes:
CWB- Contact Water Basin
NCWIB- Non-Contact Water Infiltration Basin
TDRSA- Temporary Development Rock Storage Area
TWIS- Treated Water Infiltration System
(1) Cut, Fill and Net volumes are in cubic yards. Multiply cubic yards (yd^3) by 0.7646 to get cubic meters (m^3)
(2) Cut/Fill volumes are rounded to the nearest one hundred yd^3.
(3) Topsoil quantity assumes an average of three inches across the mine and surface backfill sites. Also assumes that 40% of the total quantity will be used on-site during construction to revegetate the disturbed areas.
(4) Assumes that CWB and NCWIB include a two-ft high berm around their perimeters, except the inlets, to prevent surface water run-on.
(5) ~~Five feet of cover soils placed over TWIS distribution piping.~~

Prepared by: REM
Checked by: JOSI

4.2.3 Excavation, Stockpiling and Earthwork Balance for Surface Structures

The preliminary earthwork balance is based on the design of the primary environmental protection structures that include the TDRSA, CWBs, NCWIBs and the TWIS. Note that grading for the other buildings and structures for the Eagle Project is considered incidental since these structures will, for the most part, be constructed at grade. Also, excavated rock during the mine development is not included in the earthwork balance since development rock will be temporarily stored in the TDRSA and eventually used as backfill in the mine stopes.

Table 4-3 provides the earthwork balance for the facility construction as displayed on Figure 4-2. The cut needed to prepare the grades for the major facilities will be used to construct the soil berms. Excess soil from the site development will be placed in berms around the facility as shown on Figure 4-2. The soils placed in the berms will be used during the reclamation phase to return the mine site area to the reclamation grades. Also, if building and other structures need fill for the final design grades, this material can be removed from the stockpiled berms.

Table 4-3
Earthwork Balance

Structure	Cut (-) (1)(yd^3)	Required Fill(2) (+) (1)(yd^3)	Net (+/-) (1)(yd^3)	Comments
Stripping/Stockpiling				Refer to Note #3- Excess
Topsoil	28,600(3)	11,400	+17,200	topsoil will be stockpiled
CWB #1(4)	28,800	1200	+27,600	--
CWB #2(4)	28,800	1200	+27,600	--
NCWIB #3(4)	15,700	1200	+14,500	--
NCWIB #4(4)	8,500	800	+7,700	--
NCWIB #5(4)	4,800	700	+4,100	--
NCWIB #6(4)	1,300	400	+900	--
TDRSA	134,800	2,600	+ 132,200	--
Berms	--------	231,800	-231,800	See Figure 4-2
Total	251,300	251,300	0	

Notes:
CWB- Contact Water Basin
NCWIB- Non-Contact Water Infiltration Basin
TDRSA- Temporary Development Rock Storage Area
TWIS- Treated Water Infiltration System
(1) Cut, Fill and Net volumes are in cubic yards. Multiply cubic yards (yd^3) by 0.7646 to get cubic meters (m^3)
(2) Cut/Fill volumes are rounded to the nearest one hundred yd^3.
(3) Topsoil quantity assumes an average of three inches across the mine and surface backfill sites. Also assumes that 40% of the total quantity will be used on-site during construction to revegetate the disturbed areas.
(4) Assumes that CWB and NCWIB include a two-ft high berm around their perimeters, except the inlets, to prevent surface water run-on.

Prepared by: REM
Checked by: JOSI

The water treatment system includes the following processes:

- CWBs
- Main wastewater treatment process
- Concentrate reduction process
- Evaporation/Crystallization process
- Sludge handling process
- TWIS

Detailed descriptions of these processes are provided in the *Groundwater Discharge Permit Application* (Foth & Van Dyke, 2006).

All wastewater generated at the Eagle Project, with the exception of sanitary wastewater, will be routed to, and temporarily stored in CWBs No.1 and No.2. Appendix E provides the design capacity of the CWBs. A cross section and details of the CWBs are shown on Figure 4-19. These basins will provide wastewater storage and equalization capacity. Wastewater will be pumped from these basins to the WWTP.

The main wastewater treatment process will include a base treatment system and an advanced treatment system. The base treatment system will include pH adjustment, metals precipitation, and filtration to substantially reduce the mass of dissolved solids present in the raw wastewater. The advanced treatment system will include a reverse osmosis system and pH adjustment as a polishing step to further reduce the concentrations of dissolved solids in the base treatment system effluent. The discharge streams from the final wastewater treatment process will include treated water, metals precipitation sludge, and reverse osmosis concentrate. The treated water will be suitable for discharge to groundwater the TWIS. The TWIS consists of series of distribution piping connecting to five surface based ~~subsurface~~ infiltration cells. Within each infiltration cell will be ~~1.5~~ 2-in diameter perforated HDPE ~~PVC~~ discharge piping covered with insulation. ~~5 ft of select soils, then topsoiled and seeded.~~ The metals precipitation sludge will be routed to the sludge handling process for dewatering. The reverse osmosis concentrate will be routed to the concentrate reduction process (CRP) for treatment and volume reduction.

The CRP will be provided to maximize the water recovery for the WWTP and correspondingly minimize the volume of concentrate treated by the evaporator/crystallizer process. The CRP will treat the concentrate from the main wastewater treatment process reverse osmosis system. The treatment processes proposed for this system include breakpoint chlorination, softening/metals precipitation, micro filtration, pH adjustment, reverse osmosis, and ion exchange. The discharge streams from the concentrate reduction process will include treated water, microfiltration sludge, and reverse osmosis concentrate. The treated water will be suitable for discharge to groundwater by way of the TWIS. The microfiltration sludge will be routed to the sludge handling process for dewatering. The reverse osmosis concentrate will be routed to an evaporation/crystallization process for volume reduction or incorporated with the cemented mine backfill.

The sludge handling process will dewater sludge from the main wastewater treatment process metals precipitation/sedimentation system and sludge from the concentrate reduction process micro filtration system. A plate and frame filter press will be used for sludge dewatering. Filtrate from the filter press will be routed back to the head end of the concentrate reduction process for

The water treatment system includes the following processes:

- CWBs
- Main wastewater treatment process
- Concentrate reduction process
- Evaporation/Crystallization process
- Sludge handling process
- TWIS

Detailed descriptions of these processes are provided in the *Groundwater Discharge Permit Application* (Foth & Van Dyke, 2006).

All wastewater generated at the Eagle Project, with the exception of sanitary wastewater, will be routed to, and temporarily stored in CWBs No.1 and No.2. Appendix E provides the design capacity of the CWBs. A cross section and details of the CWBs are shown on Figure 4-19. These basins will provide wastewater storage and equalization capacity. Wastewater will be pumped from these basins to the WWTP.

The main wastewater treatment process will include a base treatment system and an advanced treatment system. The base treatment system will include pH adjustment, metals precipitation, and filtration to substantially reduce the mass of dissolved solids present in the raw wastewater. The advanced treatment system will include a reverse osmosis system and pH adjustment as a polishing step to further reduce the concentrations of dissolved solids in the base treatment system effluent. The discharge streams from the final wastewater treatment process will include treated water, metals precipitation sludge, and reverse osmosis concentrate. The treated water will be suitable for discharge to groundwater the TWIS. The TWIS consists of series of distribution piping connecting to five surface based infiltration cells. Within each infiltration cell will be 2-in diameter perforated HDPE discharge piping covered with insulation. The metals precipitation sludge will be routed to the sludge handling process for dewatering. The reverse osmosis concentrate will be routed to the concentrate reduction process (CRP) for treatment and volume reduction.

The CRP will be provided to maximize the water recovery for the WWTP and correspondingly minimize the volume of concentrate treated by the evaporator/crystallizer process. The CRP will treat the concentrate from the main wastewater treatment process reverse osmosis system. The treatment processes proposed for this system include breakpoint chlorination, softening/metals precipitation, micro filtration, pH adjustment, reverse osmosis, and ion exchange. The discharge streams from the concentrate reduction process will include treated water, microfiltration sludge, and reverse osmosis concentrate. The treated water will be suitable for discharge to groundwater by way of the TWIS. The microfiltration sludge will be routed to the sludge handling process for dewatering. The reverse osmosis concentrate will be routed to an evaporation/crystallization process for volume reduction or incorporated with the cemented mine backfill.

The sludge handling process will dewater sludge from the main wastewater treatment process metals precipitation/sedimentation system and sludge from the concentrate reduction process micro filtration system. A plate and frame filter press will be used for sludge dewatering. Filtrate from the filter press will be routed back to the head end of the concentrate reduction process for have been designed with an emergency overflow structure that will have an industrial storm water discharge permit from the MD EQ.

8.1.5.3 Treated Water Infiltration System

Treated water will be piped from the WWTP to the TWIS in a buried pipeline. The treated water will be discharged to the on-site sandy soils through the TWIS. The TWIS will be located in highly permeable soil. The treated effluent will be applied evenly within individual infiltration cells and discharged to groundwater. The treated effluent will be applied to the TWIS through five separate infiltration cells. This design will allow at least one cell to be out of service for resting and/or maintenance while the other cells are being used.

Potential failure mechanisms of the TWIS include reduced infiltration capacity, pipe breakage and frost damage. The infiltration capacity of the TWIS is designed with a capacity that is greater than the capacity of the WWTP. In the unlikely event that the infiltration capacity becomes reduced over time, additional capacity could be constructed adjacent to the proposed footprint. If pipe breakage occurs, the damaged sections will be removed and replaced. Frost is not expected to be a problem. As a contingency against frost damage, the TWIS will be covered with a layer of insulation. ~~used for stockpiling some of the excess topsoil stripped from the site~~. The insulation ~~This five feet of additional soil cover~~ will preclude frost penetration to the depth of the infiltration zone.

8.1.6 Berm Failures

This section discusses contingency actions to be taken in the event of berm failures at the CWBs and TDRSA. Liner failures are discussed in Section 8.1.12.

Embankment failure of the CWBs or the TDRSA is not likely due to the very small height of the embankments, and the flat slopes and the stable nature of the onsite foundation soils at the site. Due to the short embankment height and excellent foundation soils on-site, berm failure is a very nominal risk. In addition, all construction will be under strict *QAlQC* procedures to verify good construction of the embankments.

Overtopping of the CWBs is also very unlikely due to 2 ft freeboard above an already very conservative design. In addition, in the event of a catastrophic flood event, the TDRSA will be used for excess water storage. Erosion on the external berm slopes could be caused by unusually high precipitation. Erosion control contingency measures will be to quickly repair potential rutting or other soil instability with conventional earth moving equipment.

8.1.7 Air Emissions

The construction, operation and reclamation phases of the project will be performed in a manner to minimize the potential for accidents or failures that could result in off-site air quality impacts. All phases of the project will incorporate a combination of operating and work practices, maintenance practices, emission controls and engineering design to minimize potential accidents or failures. Below is a description of identified areas of risk and associated contingency measures that may be required. As part of a comprehensive environmental control plan, these contingency measures will assist in minimizing air impacts to the surrounding area.

have been designed with an emergency overflow structure that will have an industrial storm water discharge permit from the MD EQ.

8.1.5.3 Treated Water Infiltration System

Treated water will be piped from the WWTP to the TWIS in a buried pipeline. The treated water will be discharged to the on-site sandy soils through the TWIS. The TWIS will be located in highly permeable soil. The treated effluent will be applied evenly within individual infiltration cells and discharged to groundwater. The treated effluent will be applied to the TWIS through five separate infiltration cells. This design will allow at least one cell to be out of service for resting and/or maintenance while the other cells are being used.

Potential failure mechanisms of the TWIS include reduced infiltration capacity, pipe breakage and frost damage. The infiltration capacity of the TWIS is designed with a capacity that is greater than the capacity of the WWTP. In the unlikely event that the infiltration capacity becomes reduced over time, additional capacity could be constructed adjacent to the proposed footprint. If pipe breakage occurs, the damaged sections will be removed and replaced. Frost is not expected to be a problem. As a contingency against frost damage, the TWIS will be covered with a layer of insulation. The insulation will preclude frost penetration to the depth of the infiltration zone.

8.1.6 Berm Failures

This section discusses contingency actions to be taken in the event of berm failures at the CWBs and TDRSA. Liner failures are discussed in Section 8.1.12.

Embankment failure of the CWBs or the TDRSA is not likely due to the very small height of the embankments, and the flat slopes and the stable nature of the onsite foundation soils at the site. Due to the short embankment height and excellent foundation soils on-site, berm failure is a very nominal risk. In addition, all construction will be under strict *QAlQC* procedures to verify good construction of the embankments.

Overtopping of the CWBs is also very unlikely due to 2 ft freeboard above an already very conservative design. In addition, in the event of a catastrophic flood event, the TDRSA will be used for excess water storage. Erosion on the external berm slopes could be caused by unusually high precipitation. Erosion control contingency measures will be to quickly repair potential rutting or other soil instability with conventional earth moving equipment.

8.1.7 Air Emissions

The construction, operation and reclamation phases of the project will be performed in a manner to minimize the potential for accidents or failures that could result in off-site air quality impacts. All phases of the project will incorporate a combination of operating and work practices, maintenance practices, emission controls and engineering design to minimize potential accidents or failures. Below is a description of identified areas of risk and associated contingency measures that may be required. As part of a comprehensive environmental control plan, these contingency measures will assist in minimizing air impacts to the surrounding area.